Altered Gait Strategy in Individuals with a History of Multiple Concussions

Thomas A. Buckley, Jessie R. Oldham, Kelsey M. Evans, Barry A. Munkasy
University of Delaware, Newark, DE, Georgia Southern University, Statesboro, GA

A history of multiple concussions, specifically three or more concussions, is frequently associated with numerous short and long term neuropathologies. Impairments in postural control are a known acute consequence of concussion; however, limited evidence exists on the effects of multiple concussions on postural control, specifically gait performance. **PURPOSE**: To assess gait stepping characteristics in collegiate aged student-athletes based on concussion history. **METHODS**: 42 participants divided into two even groups based on concussion history: ≥3 concussions (N=21, 19.7 ± 1.3 years old, ht: 1.76 ± 0.15m, wt: 84.1 ± 23.7kg, 3.7 ± 1.3 prior concussions, Range: 3 – 8) and 0 concussions (N=21, 19.7 ± 1.3 years old, ht: 1.76 ± 0.12m, wt: 83.7 ± 19.5kg, 0 ± 0 concussions). All participants completed 10 trials of single task gait on a 4.9m instrumented valid and reliable walkway. The dependent variables of interest were step velocity, step length, base of support width, double support time, and the percentage of the gait cycle in stance. Dependent variables were compared between groups with independent sample t-tests. **RESULTS**: The 0 concussion group performed significantly better than the >3 group on Step Velocity (1.43 ± 0.13 m/s and 1.32 ± 0.13 m/s, P=0.028), Step Length (0.73 ± 0.04 m and 0.69 ± 0.06 m/s, P=0.038), Base of Support Width (12.0 ± 3.2cm and 14.7 ± 3.5cm, P=0.025), Double Support Time (0.21 ± 0.03s and 0.25 ± 0.03s, P=0.016), but no differences were noted in Stance Percentage (0: 60.6 ± 1.3% and ≥3: 61.2 ± 1.3%. P=0.305). **CONCLUSION**: Individuals with a history of three of more concussions demonstrate impairments in single task gait performance. While the 0 concussion group's gait performance was typical of a healthy young adult population, the ≥3 concussion group performance was indicative of a conservative gait strategy as evidenced by slower, shorter, and wider steps with more time in double support. While neuropsychological findings have been inconclusive, this study supports a prior findings which indicates multiple concussions can impair postural control. This finding provides evidence of subtle impairments in postural control amongst individuals with prior history of ≥3 concussion which could be an early indicator of future neurological deficiencies.

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